

Claims

- [c1] A two-phase electrophoretic medium comprising a continuous phase and a discontinuous phase, the discontinuous phase comprising a plurality of droplets, each of which comprises a suspending fluid and at least one particle disposed within the suspending fluid and capable of moving through the fluid upon application of an electric field to the electrophoretic medium, the continuous phase surrounding and encapsulating the discontinuous phase, the discontinuous phase comprising at least about 40 per cent by volume of the electrophoretic medium.
- [c2] A two-phase electrophoretic medium according to claim 1 wherein said discontinuous phase comprises about 40 to about 95 percent by volume.
- [c3] A two-phase electrophoretic medium according to claim 2 wherein said discontinuous phase comprises about 50 to about 80 percent by volume.
- [c4] A two-phase electrophoretic medium according to claim 3 wherein said discontinuous phase comprises about 60 to about 70 percent by volume.
- [c5] A two-phase electrophoretic medium according to claim 1 wherein said droplets comprise a single type of particle disposed in a colored suspending fluid.
- [c6] A two-phase electrophoretic medium according to claim 1 wherein said droplets comprise at least two types of particles differing in at least one of charge polarity and electrophoretic mobility, and wherein said suspending fluid is colored.
- [c7] A two-phase electrophoretic medium according to claim 1 wherein said droplets comprise at least two types of particles differing in at least one of charge polarity and electrophoretic mobility, and wherein said suspending fluid is uncolored.
- [c8] A two-phase electrophoretic medium according to claim 1 wherein said suspending fluid is selected from organic solvents, halogenated solvents, halogenated polymers, silicone oils, linear hydrocarbons, branched hydrocarbons, and mixtures thereof.

- [c9] A suspending fluid according to claim 12 wherein said halogenated polymer comprises poly(chlorotrifluoroethylene).
- [c10] A two-phase electrophoretic medium according to claim 1 wherein said particles comprises one or more of neat pigments, dyed pigments, laked pigments, and pigment/polymer composites.
- [c11] A two-phase electrophoretic medium according to claim 1 wherein said droplets contain two types of particles comprising titania and carbon black respectively.
- [c12] A continuous phase according to claim 1 wherein said continuous phase comprises a radiation-cured material.
- [c13] A continuous phase according to claim 1 wherein said continuous phase comprises gelatin.
- [c14] A two-phase electrophoretic medium according to claim 1 in that gelatin comprises 5 percent to about 15 percent by weight of said electrophoretic medium.
- [c15] A process for producing a two-phase electrophoretic medium, this process comprising:
- providing a liquid medium comprising a film-forming material;
 - dispersing in the liquid medium a plurality of droplets, each of which comprises a suspending fluid and at least one particle disposed within the suspending fluid and capable of moving through the fluid upon application of an electric field thereby forming a droplet-containing liquid medium; and
 - subjecting the droplet-containing liquid medium to conditions effective to cause the film-forming material therein to form a film, and thereby producing a two-phase electrophoretic medium in which the film-forming material forms a continuous phase surrounding and encapsulating the droplets, which form the discontinuous phase of the electrophoretic medium, the discontinuous phase comprising at least about 40 percent by volume of the electrophoretic medium.

[c16] A process according to claim 15 wherein said film-forming material comprises gelatin.

[c17] A process according to claim 16 wherein gelatin comprises about 5 percent to about 15 percent by weight of said electrophoretic medium.

[c18] A process according to claim 16 wherein said suspending fluid is selected from organic solvents, halogenated solvents, halogenated polymers, silicone oils, linear hydrocarbons, branched hydrocarbons and mixtures thereof.

[c19] A suspending fluid according to claim 18 wherein said halogenated polymer comprises poly(chlorotrifluoroethylene).

[c20] A two-phase electrophoretic medium according to claim 15 wherein said droplets contain two types of particles comprising titania and carbon black respectively.

[c21] A process according to claim 15 wherein said dispersion of said plurality of droplets in the liquid medium is effected by any one or more of variable speed mixing, sonication, shearing and colloid milling.

[c22] A process according to claim 15 wherein said conditions effective to cause the film-forming material therein to form a film comprise any one or more of radiation-curing, heating, cooling, drying, polymerization, cross-linking, sol-gel formation, and pressure-curing.

[c23] A process according to claim 15 wherein, prior to being exposed to said conditions to cause said film formation, said droplet-containing liquid medium is spread as a layer having a thickness of at least about 50 μ m onto a substrate.

[c24] A process according to claim 23 wherein prior to being exposed to said conditions to cause said film formation, said droplet-containing liquid medium is spread as a layer having a thickness of about 50 μ m to about 200 μ m onto a substrate.

[c25] A process according to claim 24 wherein prior to being exposed to said

conditions to cause said film formation, said droplet-containing liquid medium is spread as a layer having a thickness of about 100 μ m onto a substrate.

[c26] A process according to claim 15 wherein said droplets comprises an average initial size of about 25 percent to about 400 percent of the thickness of the final film.

[c27] A process according to claim 15 wherein said discontinuous phase comprises about 40 to about 95 percent by volume of the electrophoretic medium.

[c28] A process according to claim 27 wherein said discontinuous phase comprises about 50 to about 80 percent by volume.

[c29] A process according to claim 28 wherein said discontinuous phase comprises about 60 to about 70 percent by volume.